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## (54) METHOD FOR MANUFACTURING METAL FOIL LAMINATED SHEET

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a manufacturing method capable of developing excellent solder heat resistance while suppressing the lowering of mechanical strength in a process for manufacturing a metal foil laminated sheet having a film, which comprises a thermoplastic resin composition based on a crystalline polyaryl ketone resin and an amorphous polyetherimide resin, as a base material.

SOLUTION: A conductor foil is thermally welded to a film, which is formed from a mixture prepared by mixing not more than 30 pts.wt. of an inorganic filler with 100 pts.wt. of a resin composition consisting of 70-30 wt.% of (A) the crystalline polyaryl ketone resin with a crystal fusion peak temperature of 260°C or higher and 30-70 wt.% of (B) the amorphous polyetherimide resin, without interposing an adhesive layer to be subjected to crystallization treatment, and a conductive circuit is formed on the conductor foil to manufacture the metal foil laminated sheet. In this method, crystallization treatment is performed within a specific temperature range.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of a metallic foil laminate of having used the crystallization art which makes solder thermal resistance discovering, controlling lowering of a mechanical strength in the manufacture process of the metallic foil laminate which uses as a base material the film which consists of a thermoplastics constituent which uses crystalline poly aryl ketone resin and amorphous polyetherimide resin as a principal component further at a detail about the manufacture approach of the metallic foil laminate which carried out the laminating of the conductive foil to the base material film by thermal melting arrival through the glue line.

[0002]

[Description of the Prior Art] Since it excels in thermal resistance, fire retardancy, hydrolysis-proof nature, chemical resistance, etc., many crystalline poly aryl ketone resin represented by polyether ether ketone resin is adopted centering on aircraft components, and the electrical and electric equipment and electronic parts. However, heat-resistant amelioration examination has been variously performed from poly aryl ketone resin having a glass transition temperature of the top where a raw material price is very expensive, and resin itself comparatively as low as about about 140-170 degrees C. As a system which shows good compatibility also in it, the blend with amorphous polyetherimide resin has attracted attention. For example, the mixed constituent of poly aryl ketone resin and amorphous polyetherimide resin is indicated by JP,59-187054,A and the \*\*\*\*\* No. 500023 [ 61 to ] official report, and it is indicated at JP,59-115353,A that these constituents are also useful to a circuit plate base material. Furthermore, this invention person etc. has proposed the printed-circuit board using the above-mentioned mixed constituent, and its manufacture approach by JP,2000-38464,A, JP,2000-200950,A, etc.

[0003] However, the crystalline poly aryl ketone resin independent twist also had the slow crystallization rate, and for this reason, the mixed constituent of crystalline poly aryl ketone resin and amorphous polyetherimide resin needed to carry out crystallization processing, in order to make thermal resistance, such as solder thermal resistance, discover. When this crystallization processing was performed here, there were a mechanical strength and a problem that \*\*\*\* reinforcement fell substantially in the metallic foil laminate of thin meat, such as a flexible-printed-wiring substrate, especially, according to the condition. When this \*\*\*\* reinforcement was low, since folding endurance and flexibility are spoiled, the connection dependability of a substrate cannot be secured, but there is a problem that the application range will be limited, and the amelioration was desired.

[0004]

[Problem(s) to be Solved by the Invention] The object of this invention is using the film which consists of crystalline poly aryl ketone resin and amorphous polyetherimide resin to offer the manufacture approach of the metallic foil laminate which raised the mechanical strength, holding dimensional stability, thermal resistance, etc.

[0005]

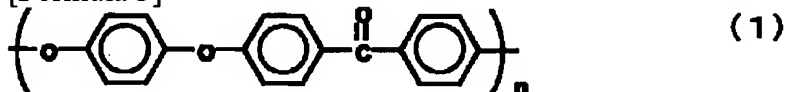
[Means for Solving the Problem] this invention persons came to complete a header and this invention for the manufacture approach of the metallic foil laminate which can solve the above-mentioned technical problem by controlling the crystallization conditions of the base material film of a metallic foil laminate to a specific temperature requirement, as a result of repeating examination wholeheartedly. Namely, the place made into the summary of this invention As opposed to the resin constituent 100 weight section which crystal fusion peak temperature becomes from the poly aryl ketone resin (A)70-30 % of the weight which is 260 degrees C or more, and amorphous polyetherimide resin (B)30-70 % of the weight Thermal melting arrival and crystallization processing of the conductive foil are carried out through a glue line at least at one side of the film which mixed the inorganic filler below in 30 weight sections. It is the manufacture approach of the metallic foil laminate which comes to form a conductive circuit in this conductive foil, and consists in the manufacture approach of the metallic foil laminate characterized by performing this crystallization processing in the temperature requirement with which are satisfied of the following relational expression.

$T_g(A) \leq T_x \leq T_g(B) + 20$  (among a formula,  $T_g(A)$  and  $T_g(B)$  show the glass transition temperature (degree C) for which it asked from the peak temperature of the loss modulus ( $E''$ ) in dynamic viscoelasticity measurement (oscillation frequency 6.28 rad/sec) of the crystalline poly aryl ketone resin (A) simple substance and an amorphous polyetherimide resin (B) simple substance, respectively, and  $T_x$  shows crystallization processing temperature (degree C).)

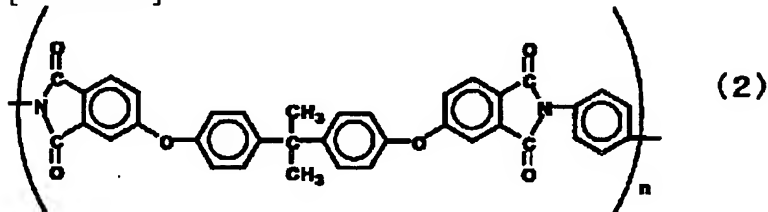
[0006] Moreover, as the above-mentioned crystalline poly aryl ketone resin, the polyetherimide resin which has the repeat unit of the following structure expression (2) can use suitably especially as the polyether ether ketone resin which has the repeat unit of the following structure expression (1), and amorphous polyetherimide resin.

[0007]

[Formula 3]



[Formula 4]

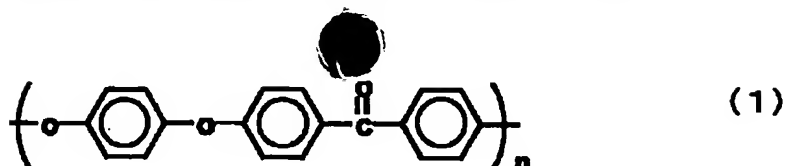


[0008]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. The film applied to this invention is a film which mixed the inorganic filler below in 30 weight sections to the resin constituent 100 weight section which consists of crystalline poly aryl ketone resin (A)70-30 % of the weight and amorphous polyetherimide resin (B)30-70 % of the weight. The comparatively thick thick sheet is also included in the film of this invention. Here, although the crystalline poly aryl ketone resin which constitutes this invention is thermoplastics which includes nucleus association, ether linkage, and ketone association in the structural unit and there are a polyether ketone, a polyether ether ketone, a polyether ketone ketone, etc. as the example of representation, in this invention, the polyether ether ketone which has the repeat unit shown in the following structure expression (1) is used suitably. The polyether ether ketone which has this repeat unit is marketed as the trade name made from VICTREX "PEEK151G", "PEEK381G", "PEEK450G", etc.

[0009]

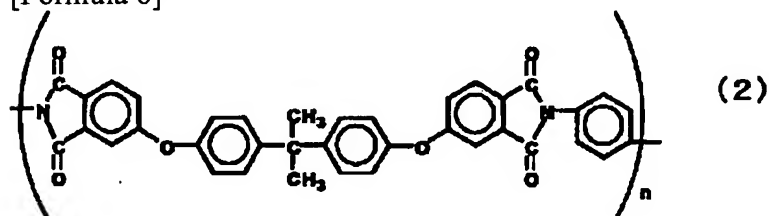
[Formula 5]



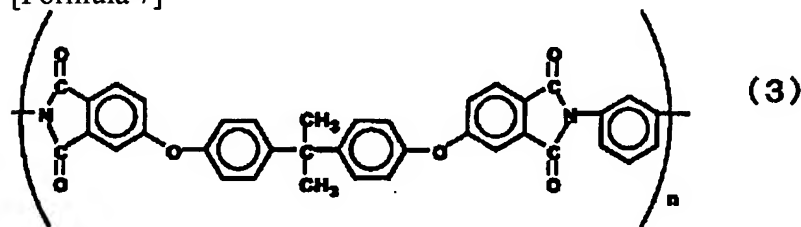
[0010] Moreover, amorphous polyetherimide resin is amorphous thermoplastics including nucleus association, ether linkage, and imide association, and is not especially restricted to the structural unit. The polyether imide which specifically has the repeat unit shown in the following structure expression (2) and (3) is marketed as General Electric a trade name "UltemCRS5001" and "Ultem 1000", and can both apply, respectively. In this invention, the polyether imide which has the repeat unit shown in the following structure expression (2) is used especially suitably. In the mixed constituent of the polyether ether ketone which probably has the above-mentioned structure expression (1) although this reason is not clear, and the polyetherimide resin which has the following structure expression (2), unlike the mixed constituent of the polyether ether ketone in which the electronic interaction between molecules has the above-mentioned structure expression (1), and the polyetherimide resin which has the following structure expression (3), since compatibility is inferior, characteristic higher order structure is formed and it is thought that this has also contributed to improvement in a mechanical strength (\*\*\*\* reinforcement).

[0011]

[Formula 6]



[Formula 7]



[0012] Although especially the manufacture approach of amorphous polyetherimide resin is not limited, the amorphous polyetherimide resin which has the above-mentioned structure expression (2) usually 4 and 4' -- as a polycondensation object of -[isopropylidene screw (p-phenyleneoxy) JIFUTARU acid 2 anhydride and p-phenylene diamine moreover, the amorphous polyetherimide resin which has the above-mentioned structure expression (3) -- 4 and 4' -- it is compounded by the approach well-known as a polycondensation object of -[isopropylidene screw (p-phenyleneoxy) JIFUTARU acid 2 anhydride and m-phenylenediamine. Moreover, other monomeric units which can be copolymerized in the range which does not exceed the meaning of this invention may be introduced into the amorphous polyetherimide resin mentioned above.

[0013] In the above-mentioned resin constituent crystalline poly aryl ketone resin exceeds 70 % of the weight, or amorphous polyetherimide resin at less than 30 % of the weight Since there is little effectiveness of raising the glass transition temperature as the whole constituent, thermal resistance tends to become inadequate, or Since the crystal structures, such as a spherulite, will grow and develop into altitude if crystallization processing is performed, since crystallinity is high, a mechanical strength tends to fall, and the volumetric shrinkage (dimensional change) accompanying crystallization becomes large and the dependability as the circuit board falls, it is not desirable. Moreover, when crystalline poly aryl ketone resin is less than 30 % of the weight or amorphous polyetherimide resin exceeds 70 % of the

weight, the crystallinity as the whole constituent itself is low, and since solder thermal resistance falls even if a crystallization rate also becomes slow too much and crystal fusion peak temperature is 260 degrees C or more, it is not desirable. In this invention, the mixed constituent which consists of the 65 - 35 % of the weight of the above-mentioned poly aryl ketone resin and 35 - 65 % of the weight of amorphous polyetherimide resin is suitably used from this.

[0014] Moreover, if the inorganic filler mixed to the resin constituent 100 weight section mentioned above exceeds 30 weight sections, since mechanical strengths, such as the flexibility of a film and tear reinforcement, fall, it is not desirable. Moreover, generally there is little effectiveness of falling coefficient of linear expansion and raising dimensional stability under at 10 weight sections. The suitable amount of mixing of an inorganic filler is 10 - 30 weight section from this to the resin constituent 100 weight section mentioned above. As an inorganic filler to be used, there is especially no limit and any well-known things can use it. For example, talc, a mica, clay, glass, an alumina, a silica, aluminum nitride, silicon nitride, etc. are mentioned, and these are independent and can use one kind combining two or more kinds. Especially, the inorganic filler whose mean particle diameter is about 1-20 micrometers and whose average aspect ratio (particle size/thickness) is 20 to about 50 has the highly desirable effectiveness of raising dimensional stability, without reducing a mechanical strength with a low addition (10 - 25 weight section extent).

[0015] Various additives other than other resin and inorganic fillers, for example, a thermostabilizer, an ultraviolet ray absorbent, light stabilizer, a nucleating additive, a coloring agent, lubricant, a flame retarder, etc. may be suitably blended with extent which does not spoil the property in the resin constituent which constitutes this invention film. Moreover, the mixed approach of various additives including an inorganic filler can use a well-known approach. For example, the masterbatch which mixed (a) various additives at high concentration (it is about 10 - 60 % of the weight as a typical content) to suitable base resin, such as poly aryl ketone resin and/or amorphous polyetherimide resin, is produced separately. Concentration is adjusted to the resin which uses this, it mixes, and the approach of blending mechanically using a kneader, an extruder, etc., the approach of using a kneader, an extruder, etc. for the resin which carries out (b) activity, and blending direct various additives mechanically, etc. are mentioned. In the above-mentioned mixed approach, the masterbatch of (a) is produced and the approach of mixing is desirable from the point of dispersibility or workability. Furthermore, on the surface of a film, embossing, corona treatment, etc. may be suitably performed for amelioration of handling nature etc.

[0016] Although a well-known approach, for example, the extrusion cast method, the calender method, etc. using a T die, can be adopted as this invention film production approach and it is not limited especially, the extrusion cast method using fields, such as the film production nature of a sheet and stable productivity, to a T die is desirable. Although the molding temperature in the extrusion cast method using a T die is suitably adjusted by flowability, film production nature, etc. of a constituent, it is 430 degrees C or less more than the melting point in general. Moreover, the thickness of this film is usually about 25-300 micrometers.

[0017] Next, the metallic foil laminate applied to this invention is a substrate which carries out thermal melting arrival and crystallization processing of the conductive foil through a glue line at least at one side of the film mentioned above, and comes to form a conductive circuit in this conductive foil. It is most important to perform this crystallization processing in this invention here in the temperature requirement with which are satisfied of the following relational expression.

Among the  $T_g(A) \leq T_x \leq T_g(B) + 20$  type,  $T_g(A)$  and  $T_g(B)$  show the glass transition temperature (degree C) for which it asked from the peak temperature of the loss modulus ( $E''$ ) in dynamic viscoelasticity measurement (oscillation frequency 6.28 rad/sec) of the crystalline poly aryl ketone resin (A) simple substance and an amorphous polyetherimide resin (B) simple substance, respectively, and  $T_x$  shows crystallization processing temperature (degree C).

[0018] In the above-mentioned relational expression crystallization processing temperature ( $T_x$ ) under by  $T_g(A)$  (i.e., under the glass transition temperature of the poly aryl ketone resin (A) simple substance) If it is almost impractical very slow [ the speed of advance of crystallization ] and  $T_g(B) + 20$  degree C is

exceeded on the other hand That is, although crystallization advances enough and also discovers solder thermal resistance, it is easy to fall and is not desirable [ crystallization / \*\*\*\* reinforcement ], if the glass transition temperature of +20 degrees C of an amorphous polyetherimide resin (B) simple substance is exceeded so that the term of the example mentioned later may also explain. Although this reason is not clear, if crystallization processing temperature (Tx) probably exceeds the glass transition temperature of +20 degrees C of an amorphous polyetherimide resin (B) simple substance, the molecular motion nature of an amorphous polyetherimide resin (B) component becomes intense, the crystal structures, such as a spherulite originating in the crystal component of poly aryl ketone resin (A), will grow and develop into altitude from this, these interfaces will serve as a defect, and it will be thought that a mechanical strength (\*\*\*\* reinforcement) falls. the heat-treatment-temperature range suitable from this -- more than Tg(A)+20 degree C and Tg (B) -- +15 degrees C or less are less than [ Tg(B)+15 degree C ] still more preferably more than the glass transition temperature of the resin constituent which consists of a (A) component and a (B) component.

[0019] In addition, the glass transition temperature (Tg) used in this invention is the value calculated as follows. That is, using SOLIDS ANALYZER RSA-II by REOMETO Rix Corp., it measured by part for oscillation frequency 6.28 rad/sec and programming-rate/of 1 degree C, and the peak value of a loss modulus (E'') was calculated from the obtained data, and temperature at that time was made into glass transition temperature (Tg). Here, the peak temperature of a loss modulus (E'') is temperature from which the first differential value of the variation to the temperature of the value of E'' serves as zero. Moreover, the weighted solidity acquired when crystallization processing performs a differential scanning calorimetry using the film of a base material in this invention says filling the following relational expression.

$[(\Delta H_m - \Delta H_c) / \Delta H_m] \geq 0.90$  --  $\Delta H_m$  is the amount (J/g) of crystal heat of fusions measured when temperature up is carried out by the differential scanning calorimetry among a formula here, and  $\Delta H_c$  is the amount (J/g) of heat of crystallization generated by crystallization in temperature up.

[0020] In addition, amount of crystal heat of fusions  $\Delta H_m$  (J/g) and amount of heat of crystallization  $\Delta H_c$  (J/g) are the values calculated as follows. namely, the PerkinElmer, Inc. make -- it asked using DSC-7 from the thermogram when carrying out temperature up of the 10mg of the samples from a room temperature to 400 degrees C by part for heating rate/of 10 degrees C according to JIS-K7122. Although it is dependent on the ratio of the class, the molecular weight, and the constituent of a raw material polymer etc., it depends for the value of this relational expression  $[(\Delta H_m - \Delta H_c) / \Delta H_m]$  on shaping / processing conditions, especially the crystallization processing conditions of a film greatly. That is, in case a film is produced, after carrying out melting of the raw material polymer, if it cools promptly, this numeric value will become small. Moreover, in crystallization processing conditions, if the processing time is lengthened at a certain processing temperature, this numeric value can be enlarged. The maximum of this numeric value is 1.0, and it means that crystallization is advancing, so that a numeric value is large. Crystallization does not fully advance [ this numeric value ] less than by 0.90, and it becomes [ solder thermal resistance / tend ] inadequate in dimensional stability falling and is not desirable here.

[0021] Although the temperature condition is dramatically important in crystallization processing as mentioned above, especially the method and time amount are not limited. For example, as a heat treatment method, the approach (the outline crystallizing method) of crystallizing with an air-heating furnace, a heat press, etc. can be mentioned out of the approach (the in-line crystallizing method) of crystallizing with a heat treatment roll, an air-heating furnace, etc. in the approach (the cast crystallizing method) of crystallizing at the time of the extrusion cast, or a film production line, and a film production line. In this invention, the outline crystallizing method is suitably used from the stability of production, and the homogeneity of physical properties. Moreover, about heat treatment time amount, the range of about 3 hours is [ that what is necessary is just to satisfy the above-mentioned relation of a formula ] suitably applicable from several minutes for several seconds to dozens hours.

[0022] In the manufacture process of a metallic foil laminate, if it is the approach of heating and

pressurizing the film mentioned above and conductive foil as an approach of carrying out thermal melting arrival through a glue line, a well-known approach can be adopted and it will not be limited especially. For example, the heat pressing method, the heat lamination rolling method, or the approach that combined these is suitably employable. Moreover, about the approach of making a conductive circuit forming in conductive foil, a well-known approach can be adopted and it is not limited especially. for example, a subtractive process (etching), an additive process (plating), die stamping (metal mold), and a conductor -- well-known approaches, such as print processes (conductive paste), are applicable. As the approach of the interlayer connection at the time of furthermore considering as a multilayer substrate, the approach of carrying out coppering to a through hole, the approach filled up with a conductive paste or a solder ball all over a through hole and an inner BAIA hole, the method of applying the anisotropic conductive ingredient by the insulating layer containing a detailed electric conduction particle, etc. are mentioned, for example. [0023] As conductive foil used for this invention, the metallic foil with a thickness of about 5-70 micrometers of copper, gold, silver, aluminum, nickel, tin, etc. is mentioned, for example. As a metallic foil, copper foil is usually used and what performed chemical conversion, such as black oxidation treatment, is further used suitably in a front face. In order to heighten the adhesion effectiveness, as for conductive foil, it is desirable to use what roughened beforehand the contact surface (field to pile up) side with a film chemically or mechanically. As an example of the conductive foil by which surface roughening processing was carried out, in case electrolytic copper foil is manufactured, the roughening copper foil processed electrochemically is mentioned.

[0024]

[Example] Although an example explains in more detail below, this invention does not receive a limit at all by these. In addition, the various measured value about a film and assessment which are displayed into this description were performed as follows. Here, the flow direction from the extruder of a film is called a lengthwise direction, and the rectangular direction is called a longitudinal direction.

[0025] (1) Glass transition temperature (Tg)

Using SOLIDS ANALYZER RSA-II by REOMETO Rix Corp., it measured by part for oscillation frequency 6.28 rad/sec and programming-rate/of 1 degree C, and the peak value of a loss modulus (E'') was calculated from the obtained data, and temperature at that time was made into glass transition temperature (Tg). In addition, the film (longitudinal direction) with a thickness of 75 micrometers which carried out quenching cast film production using the extruder equipped with the T die was used for the sample used for measurement.

[0026] (2) Crystal fusion peak temperature (Tm)

the PerkinElmer, Inc. make -- DSC-7 -- using -- 10mg of samples -- JIS According to K7121, it asked from the thermogram when carrying out temperature up of the heating rate by part for 10-degree-C/.

[0027] (3) --  $(\Delta H_m - \Delta H_c) / \Delta H_m$  PerkinElmer, Inc. make -- DSC-7 -- using -- 10mg of samples -- JIS According to K7122, amount of crystal heat of fusions  $\Delta H_m$  (J/g) and amount of heat of crystallization  $\Delta H_c$  (J/g) were calculated and computed from the thermogram when carrying out temperature up of the heating rate by part for 10-degree-C/.

[0028] (4) Bond strength JIS The ordinary state of C6481 tore off and it measured based on strength.

[0029] (5) Solder thermal resistance JIS After having floated for 10 seconds based on the solder thermal resistance of the ordinary state of C6481 so that a solder bath might contact a 260-degree C solder bath a copper foil side in a test piece, and cooling to a room temperature, viewing investigated existence, such as bulging and peeling, and the quality was judged.

[0030] (6) \*\*\*\* reinforcement JIS Based on the tear-strength-propagating trial of C2151, the test piece with a width of face [ of 15mm ] and a die length of 300mm was cut down from the film with a thickness of 75 micrometers, and the lengthwise direction and the longitudinal direction were measured the condition for speed-of-testing/of 500mm using the trial metallic ornaments B.

[0031] As shown in a table 1, the polyether ether ketone resin [product [ made from Victrex ], PEEK381G, Tg:145.3 degree-C, Tm:334 degree-C] (it may only be hereafter written as PEEK) 60 weight section, (Example 1) Polyetherimide resin [the General Electric make, Ultem-CRS5001,



Tg:226.3 degree C] The extruder equipped with the T die for the mixed constituent which consists of the 40 weight sections and a commercial mica (mean particle diameter: 10 micrometers, aspect ratio:30) is used. (It may only be hereafter written as PEI-1) With the laying temperature of 380 degrees C It extruded on the film with a thickness of 75 micrometers, and the copper foil laminate was obtained by laminating copper foil (thickness: 18 micrometers, surface surface roughening) simultaneously. The processed [ crystallization ] copper foil laminate made into the object was obtained by carrying out crystallization processing of the roll (100m volume) of the copper foil laminate furthermore obtained for 120 minutes with a 200-degree C thermostat. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0032] (Example 2) As shown in a table 1, the processed [ crystallization ] copper foil laminate made into the object like an example 1 was obtained except having changed crystallization processing temperature into 240 degrees C in the example 1. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0033] (Example 3) As shown in a table 1, the processed [ crystallization ] copper foil laminate made into the object like an example 1 was obtained except having changed PEEK and the mixed weight ratio of PEI-1 into 35 / 65 weight sections, and having changed modification and crystallization processing temperature into 220 degrees C in the example 1. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0034] (Example 4) As shown in a table 1, the processed [ crystallization ] copper foil laminate made into the object like an example 1 was obtained except having changed into polyetherimide resin [the General Electric make, Ultem-1000, Tg:217.3 degree C] (it only being hereafter written as PEI-2) PEI-1 used in the example 1. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0035] (Example 1 of a comparison) As shown in a table 1, the processed [ crystallization ] copper foil laminate made into the object like an example 1 was obtained except having changed crystallization processing temperature into 260 degrees C in the example 1. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0036] (Example 2 of a comparison) As shown in a table 1, the processed [ crystallization ] copper foil laminate made into the object like an example 4 was obtained except having changed crystallization processing temperature into 240 degrees C in the example 4. Evaluated assessment results, such as a heat characteristic and a mechanical strength, are shown in a table 1 using the obtained processed [ crystallization ] copper foil laminate.

[0037]

[A table 1]

表 1

	実施例				比較例		
	1	2	3	4	1	2	3
PEEK (重量部)	60	60	35	60	60	60	25
PEI-1 (重量部)	40	40	65		40		
PEI-2 (重量部)				40		40	75
マイカ (重量部)	20	20	20	20	20	20	20
(A) 成分の T <sub>g</sub> (°C)	145.3	145.3	145.3	145.3	145.3	145.3	145.3
(B) 成分の T <sub>g</sub> (°C)	226.3	226.3	226.3	217.3	226.3	217.3	217.3
結晶化処理温度 (°C)	200	240	220	220	260	240	220
結晶化処理時間 (分)	120	120	120	120	120	120	120
(ΔH <sub>m</sub> - ΔH <sub>c</sub> ) / ΔH <sub>m</sub>	0.98	0.99	0.99	0.98	0.99	0.99	0.99
接着強度 (N/mm)	1. 5	1. 7	1. 6	1. 6	1. 7	1. 6	1. 6
はんだ耐熱性	良好	良好	良好	良好	良好	良好	不良
端裂強度 (N)	縦	153.0	148.6	135.1	146.3	133.2	127.5
	横	117.7	78.5	72.6	58.8	48.8	24.5
総合評価	○	○	○	○	×	×	×

[0038] It turns out that each of examples 1 in the range which has the component specified by this invention, and crystallization processing temperature specifies from a table 1 thru/or copper foil laminates of 4 is excellent in solder thermal resistance and the property of both mechanical strengths (the \*\*\*\* reinforcement of the film for laminates is 55Ns or more for length and a longitudinal direction). On the other hand, it turns out [ as which crystallization processing temperature specifies it ] that being out of range (examples 1 and 2 of a comparison) and the substrate with which components differ (example 3 of a comparison) is [ a thing ] inferior to solder thermal resistance or one of the properties of a mechanical strength (\*\*\*\* reinforcement).

[0039]

[Effect of the Invention] The manufacture approach which can discover the outstanding solder thermal resistance can be offered controlling lowering of a mechanical strength in the manufacture process of the metallic foil laminate which uses as a base material the film which consists of a thermoplastics constituent which uses crystalline poly aryl ketone resin and amorphous polyetherimide resin as a principal component according to this invention.

[Translation done.]

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## CLAIMS

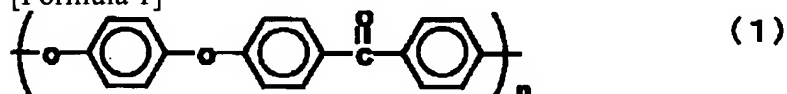
[Claim(s)]

[Claim 1] As opposed to the resin constituent 100 weight section which crystal fusion peak temperature becomes from the crystalline poly aryl ketone resin (A) 70-30 % of the weight which is 260 degrees C or more, and amorphous polyetherimide resin (B) 30-70 % of the weight Thermal melting arrival and crystallization processing of the conductive foil are carried out through a glue line at least at one side of the film which mixed the inorganic filler below in 30 weight sections. The manufacture approach of the metallic foil laminate which is the manufacture approach of the metallic foil laminate which comes to form a conductive circuit in this conductive foil, and is characterized by performing this crystallization processing in the temperature requirement with which are satisfied of the following relational expression.

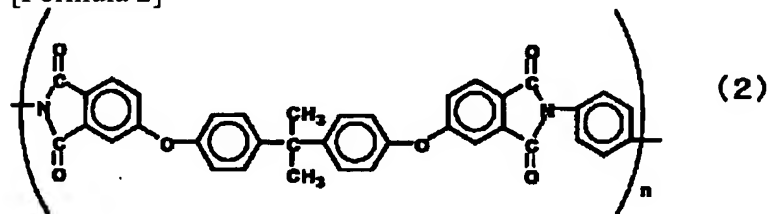
$T_g(A) \leq T_x \leq T_g(B) + 20$  (among a formula,  $T_g(A)$  and  $T_g(B)$  show the glass transition temperature (degree C) for which it asked from the peak temperature of the loss modulus ( $E''$ ) in dynamic viscoelasticity measurement (oscillation frequency 6.28 rad/sec) of the crystalline poly aryl ketone resin (A) simple substance and an amorphous polyetherimide resin (B) simple substance, respectively, and  $T_x$  shows crystallization processing temperature (degree C).)

[Claim 2] The manufacture approach of the metallic foil laminate according to claim 1 characterized by for crystalline poly aryl ketone resin being polyether ether ketone resin which has the repeat unit of the following structure expression (1), and amorphous polyetherimide resin being polyetherimide resin which has the repeat unit of the following structure expression (2).

[Formula 1]



[Formula 2]



[Claim 3] The laminate according to claim 1 to 2 with which a lengthwise direction and a longitudinal direction are characterized by the \*\*\*\* reinforcement (based on the tear-strength-propagating trial of JIS C2151) of the film used as the base material of a metallic foil laminate being 55Ns or more.

[Translation done.]